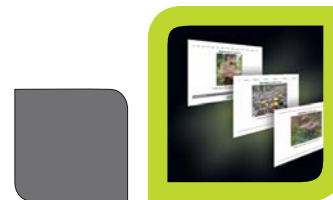


# Mushroom Habitat Flashcards



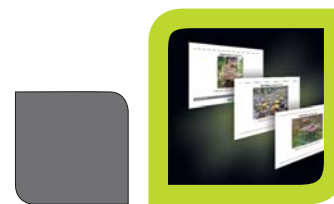
## Instructions

### Connect It Back to Nature

**What do biofuels and mushrooms have in common? ENZYMES!** These Mushroom Habitat Flashcards can help your students make the connection between an organism's natural environment and the enzyme functions it has evolved. In this activity, your students will use the information provided on the Mushroom Habitat Flashcards to make hypotheses and predictions about which mushrooms have the highest cellulase activity. This activity pairs well with Bio-Rad's Biofuel Enzyme Kit (166-5035EDU), which allows your students to test cellulase activity of mushrooms. This will illustrate the importance of enzymes and how they can be useful in the real world. You can also come up with other fun ways to use the flashcards and share them with teachers just like you at [bio-rad.com/explorercommunity](http://bio-rad.com/explorercommunity), the Explorer Community website.

### Preparation and Activity

1. Print out the Mushroom Habitat Flashcards (single-sided).
2. Place 1–2 cards at each workstation.
3. Have the students form workstation groups, discuss the information on the flashcards, and predict whether the mushrooms will have high or low cellulase activity.  
OR  
You can generate a class-wide hypothesis by asking students to rotate around the workstations, consider the information on the flashcards, and vote for which mushroom they think will have the highest activity and why.
4. Other questions to ask:
  - a. Why would mushrooms that grow on wood (e.g., on trees or stumps) evolve to have higher cellulase activity?
  - b. Will the cellulase activity be different depending on what part of the mushroom you test?
  - c. After conducting the Biofuel Enzyme Kit experiments and analyzing the data, have your students revisit their hypotheses and predictions. Do their data support their original hypothesis/prediction? If not, how will they modify their hypothesis/prediction?



### Mushroom Cellulase Activity

In general, cellulase activity of these mushrooms, from highest to lowest is, as follows:

#### **Shiitake > Oyster > Button > Chanterelle**

The reason for this order is:

1. Shiitake mushrooms grow on dense wood, which requires that the mushrooms have highly active cellulase enzymes to break this material down.
2. Oyster mushrooms are very versatile and can grow on dense woods, softwoods, and straw. Given that they are not restricted to growth solely on dense woods, it is not required that they possess such strong cellulase activity.
3. Button mushrooms grow on predigested cellulose (steer manure); therefore, they do not need to possess much cellulase activity to break the material down on their own.
4. Chanterelle mushrooms are mycorrhizal, which means that they have a symbiotic relationship with the tree roots that feed them. Strong cellulase activity could damage these roots. In light of this, it is not surprising that chanterelles exhibit little to no detectable cellulase activity in this assay.

This reasoning can be applied to the other mushrooms mentioned on the Mushroom Habitat Flashcards. The order of mushroom cellulase activity may vary slightly depending on assay conditions, such as the health of the mushroom or the part of the mushroom used.

Habitat: grows in association with  
pine tree roots.



**Matsutake** (*Tricholoma magnivelare*)

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**Enoki** (*Flammulina velutipes*)



Habitat: grows on hardwood stumps and logs.

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Habitat: grows in association with oak tree roots.



**Chanterelle** (*Cantharellus cibarius*)

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**Shiitake** (*Lentinula edodes*)



Habitat: grows on dead oak trees.

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Habitat: grows at the base of trees.



**Hen of the Woods** (*Grifola frondosa*)

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**Abalone** (*Pleurotus cystidiosus*)



Habitat: grows on the trunk of dead broadleaf trees.

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Habitat: grows in fields and on manure.



**Button** (*Agaricus bisporus*)

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### **Chicken of the Woods** (*Laetiporus sulphureus*)



Habitat: grows on tree trunks.

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Habitat: grows on living hardwood trees.



**Lion's Mane** (*Hericium erinaceus*)

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**Oyster** (*Pleurotus ostreatus*)



Habitat: grows on dead hardwood trees.

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Habitat: grows in fields on plant roots and compost.



**King Oyster** (*Pleurotus eryngii*)

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**Beech** (*Hypsizygus tessellatus*)



Habitat: grows on dead beech, poplar, and other hardwood trees.